2611

DOCKET NO.: BAI525-365/01362

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS:	NEWTON, MARK	)
Application No.:	09/960,135	)
Filing Date:	09/21/2001	)
For:	BROADCAST DATA RECEIVER AND METHOD OF USE THEREOF	)

TRANSMITTAL OF PRIORITY DOCUMENT

Director of Patents and Trademarks
Washington, D.C. 20231
Box: Non-Fee

Dear Sir:

Enclosed herewith are certified copies of British Patent Application Nos. 0023267.8 and 0102041.1 from which the above-identified patent application claims priority.

If, for any reason, these priority documents are not acceptable, please inform the undersigned as soon as possible.

Respectfully Submitted

HEAD, JOHNSON & KACHIGIAN

Date: November 1, 2001

By _____
Mark G. Kachigian, Reg. 32,840
228 West 17th Place
Tulsa, Oklahoma 74119
(918) 584-4187
Attorney for Applicant

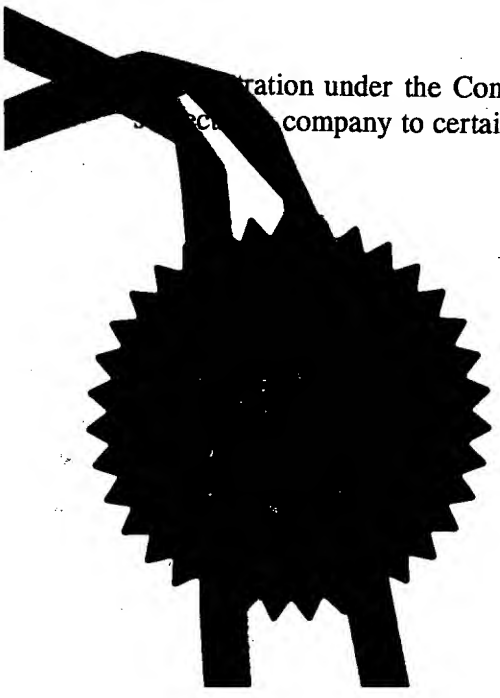
The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

CERTIFIED COPY OF PRIORITY DOCUMENT

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.



ration under the Companies Act does not constitute a new legal entity but merely ... company to certain additional company law rules.

Signed

Dated 26 September 2001

Patents Form 1/77

Patents Act 1977
(Rule 16)

The Patent Office

0023267.8

22SEP00 E570357-4 D00346
P01/7700 0.00-0023267.8

1/77

THE PATENT OFFICE
D
22 SEP 2000
NEWPORT

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference — AT-G30353

2. Patent application number *(The Patent Office will fill in this part)* — 0023267.8 — 22 SEP 2000

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Pace Micro Technology Plc

Victoria Road
Saltaire
Shipley
BD18 3LF

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation — **G.B** 7588569001

4. Title of the invention — **Broadcast Data Reeiver**

5. Name of your agent *(if you have one)* — **Bailey Walsh & Co.**

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

5, York Place
Leeds
LS1 2SD

Patents ADP number *(if you know it)* — **224001** ✓

6. If you are declaring priority from one or more earlier patent applications, give the and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / years)*

7. If this application is divided or otherwise derived from an earlier UK application, the earlier application

Number of earlier application	Date of filing *(day / month / years)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer "Yes" if:*

Yes

a) any applicant named in part 3 is not an inventor, or

b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body

See note (d)

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document.

Continuation sheets of this form	
Description	6
Claim(s)	
Abstract	
Drawing(s)	

10. If you are also filing any of the following, state how many of each item.

Priority Documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(Please specify)*	

11. I/We request the grant of a patent on the basis of this application

Signature — Date **21.09.00**

12. Name and daytime telephone number of person to contact in the United Kingdom — **A Tomkinson 0113 2433824**

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help filling in this form or you have any questions, please contact the Patent Office on 0645 500505.*

b) *Write your answers in capital letters using black ink or you may type them.*

c) *If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.*

d) *If you have answered 'Yes' Patents Form 7/77 will need to be filed.*

e) *Once you have filled in this form you must remember to sign and date it.*

f) *For details of the fee and ways to pay, please contact the Patent Office.*

Broadcast Data Receiver

This invention relates to a broadcast data receiver for use with a television system.

The television system referred to in the following description includes a display screen and a broadcast data receiver. The broadcast data receiver (BDR) allows for the generation of audio, visual and auxiliary data from digital data received from a broadcaster. In normal operation, a BDR receiving digital data will derive accurate frequency information from a stable reference embedded in the broadcast data stream.

BDRs typically contain a voltage controlled crystal oscillator (VCXO) generating a local frequency which is usually varied by up to +/- 100ppm about a nominal frequency, typically 27MHz. Off air MPEG transport stream/broadcast data streams have stable reference control signals embedded therein which are common to a 90KHz system clock reference (SCR). The microprocessor of a BDR produces a suitable pulse width modulated (PWM) waveform based on the SCR value to control the frequency of the VCXO. An accurate VCXO frequency allows accurate colour subcarrier frequency generation, thereby allowing the generation of the final video output.

Storage means such as low cost, high capacity hard disk drives are now being used for the recording and playback of audio and video data in BDRs. On occasions when the BDR is disconnected from the signal feed from the broadcaster, video data is read from the hard disk drive. Under these circumstances an accurate SCR is unavailable, as even though the stable reference signal can be recorded on the hard disk drive, upon playback it will have lost its accuracy. This is because it is being replayed under the control of the local VCXO frequency, which

is not a stable reference, rather than the SCR frequency it was originally broadcast at.

PAL decoders in televisions take composite video signals (i.e. video signals containing luminance, colour and synchronisation pulses which are generated by BDRs from the video output of BDRs and recover the constituent red, green and blue components for display on the screen of the television or monitor. The PAL decoder in an average television can lock to a colour subcarrier frequency generated by the VCXO deviating by up to +/- 200Hz. This equates to +/-45ppm about the subcarrier frequency of 4.43361975MHz. If the free run frequency of the 27MHz VCXO deviates beyond this point, as it can do when an inaccurate PWM is generated due to the absence of a stable SCR value, it is possible for the PAL decoder to lose colour lock. This can result in colour loss to the image displayed on the display screen, which is undesirable.

The aim of the present invention is to provide a BDR which allows for the reliable generation of composite video signals replayed from storage means.

According to a first aspect of the present invention there is provided a method for the production of a stable reference control for the reliable generation of composite video signals from a broadcast data receiver (BDR), said BDR receiving visual, audio and auxiliary data in the form of digital data from a broadcaster, said BDR having storage means in which to store said digital data and wherein said method includes producing a pseudo stable reference by deriving one or more values from frequency information embedded in incoming digital data.

Preferably the one or more values are average values of frequency information embedded in incoming digital data.

Preferably the pseudo stable reference is stored in the storage means and updated over pre-determined time intervals.

Preferably the storage means is in the form of a hard disk drive.

Preferably the BDR includes a microprocessor which can extract data embedded in broadcast data streams and produce a suitable PWM signal. The PWM is then used to control the local frequency of the VCXO.

Preferably the values used for the pseudo stable reference are average PWM readings recorded during the phase locked loop of software routine of the microprocessor.

The phase locked loop software compares the 90KHz SCR from the data stream to the local frequency value of the VCXO.

Preferably the one or more average PWM values include the mean or median average readings.

In one embodiment the pseudo stable reference is the average of the current PWM value, the most recent PWM value stored in the microprocessor and the oldest PWM value stored in the microprocessor.

Preferably a timer is provided in the BDR to allow a pre-determined time period to pass before the microprocessor records a PWM value. This time period allows for temperature equilibrium of the BDR

The present invention therefore allows hard disk drive video playback to be performed with conventional television receivers to produce a composite video image that can be displayed or

archived onto videocassette under typical domestic operating conditions. The pseudo stable reference is used as there is no accurate frequency information embedded in incoming digital data.

An advantage of the present invention is that it avoids the need for an expensive high stability free running oscillator to be used in the BDR. In addition, the effect of using a pseudo stable reference to drive the VCXO, which is updated at regular intervals, is to self compensate against the effects of crystal ageing (which results in frequency drift).

A further advantage of the present invention is that any seasonal changes in temperature in the operating environment of the BDR are automatically compensated for. The method is cheap and no additional hardware is required other than a standard BDR.

An embodiment of the present invention will now be described with reference to the following description:

In normal operation, the microprocessor of the BDR records the SCR embedded in incoming data streams during the phase locked loop software routine and produces a suitable PWM to control the frequency of the VCXO. The PWM readings are recorded in the non-volatile memory of the BDR at regular intervals, and can then be used subsequently as a pseudo stable reference when retrieving transport stream data from the hard disk drive.

The PWM reading stored in the non-volatile memory is typically a representative value of the BDR in temperature equilibrium. A timer can be activated in the BDR to allow a sufficient 'warm up' time to pass before the PWM reading is recorded and stored.

This warm up time may be necessary if, for example, the BDR has been left in a standby condition for an extended period of time.

The 'warm up' time can be determined by monitoring the time contained within the digital video broadcast (DVB) service information (SI), or from an embedded real time clock. It is not necessary to store both the time and the PWM reading in the non-volatile memory of the BDR.

The pseudo stable reference can be based on the means or median average of PWM values taken over a pre-determined period of time. It will be understood by persons skilled in that art that a number of different methods of calculating average readings be used to drive the VCXO at a suitable frequency.

For example, the PWM reading can be recorded after approximately 30 minutes of the BDR being activated from a standby condition. This reading will be referred to as the current reading [PWM current].

In the non-volatile memory of the BDR, two previous PWM readings are stored; [PWM recent] and [PWM oldest].

The average of the three PWM readings are taken to produce the pseudo stable reference:

$$\frac{[\text{PWM current}] + [\text{PWM recent}] + [\text{PWM oldest}]}{3}$$

The pseudo stable reference is then used as the VCXO drive value when playing back data from the hard disk of the BDR. An accurate VCXO value allows the PAL decoder to lock onto the

colour subcarrier frequency and prevents colour loss of the image displayed on the display screen.

This calculated reference value can then become the new PWM[recent] and is stored in the memory. The old PWM[recent] becomes the PWM[oldest] and is stored in the memory and the old PWM[oldest] reading is deleted from the memory.

The above process can be repeated over pre-determined time intervals. If the BDR is in a standby condition for more than 24 hours, the BDR can be moved from the standby condition to an "on condition" and allowed to reach temperature equilibrium before the PWM reading is taken, typically using the timer.

Non-volatile memory employing EEPROM technology can be used and this typically allows approximately 10,000 reliable read/write cycles to be undertaken. This equates to 27 years of operation of the memory if the PWM value is updated once every 24 hours and shows that the working life of the BDR is not compromised by the introduction of the present invention.

It can be seen from the above description that the method of the present invention reduces the effect of any non-representative high or low PWM values that may have previously been sampled and allows the VCXO to be driven at a frequency similar to the SCR value of the originally broadcast data.